



U.S. Department  
of Transportation

Federal Aviation  
Administration

# Advisory Circular

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Subject:	FAA SPECIFICATION FOR L-823, . PLUG AND RECEPTACLE, CABLE CONNECTORS	Date:	04/17/00	AC No.:	150/5345-26C
		Initiated by:	AAS-200	Change:	

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1. **PURPOSE.** This advisory circular (AC) contains the specification for plug and receptacle (cable connectors) used with underground power cables, isolation transformer leads, and light fixture leads for airport lighting systems.
2. **PRINCIPAL CHANGES.** The changes in this AC include the following:
  - a. Editorial changes to reflect the changes in the procedure **for qualifying** airport lighting equipment to be furnished under the Federal grant assistance program.,
  - b. Deleting reference to **ICEA** S-19-81, Table 7.7-8 in **defining** the bonding strength of the completed connector assembly for Class A **connectors**.
  - c. Deleting requirement for vulcanizing.
  - d. Deleting requirement for the short circuiting cap **"S"** marking to be RED.
  - e. Changing reference in the Weathering Test from UL74 to **UL** 1581.
  - f. Updating connector drawings.
  - g. Adding paragraph 5. Production Test Requirement
3. **CANCELLATION.** AC **150/5345-26B**, Specification For L-823 Plug and Receptacle, Cable Connectors, dated January **28, 1981**, is canceled.
4. **APPLICATION.** The standards contained in this AC are recommended by the Federal Aviation Administration (FAA) in all applications involving airport development of this nature. For airport projects receiving federal funds under the airport grant assistance program, the use of the standards in this AC are mandatory.
5. **METRIC** UNITS. To promote an orderly transition to metric units, this specification includes both English and metric dimensions. The metric conversions may not be exact metric equivalents, and until there is an official changeover to the metric system, the English dimensions will govern

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## FAA SPECIFICATION FOR L-823 PLUG AND RECEPTACLE, CABLE CONNECTORS

### 1. SCOPE AND CLASSIFICATION.

**1.1 Scope.** This specification contains requirements for plugs and receptacles (cable connectors) to be used for underground cable connections, for power cables, isolation **transformer** leads, and light fixture leads for airport systems.

**1.2 Classification.** Cable **connectors** are classified by this specification into two types, two classes, and six styles of plugs and two types, two classes, and six styles of receptacles. Formerly, cable connectors were classified only by a figure number. Figures in this specification are now numbered consecutively

**1.2.1 Type.** Plugs and receptacles with the following electrical characteristics are covered by the specification:

<b>Type I</b>	1 conductor, 25 ampere, 5000 volt
<b>Type II</b>	2 conductor, 20 ampere, 600 volt

**1.2.2 Class.** Plugs and receptacles with the following attachment methods are covered by this specification:

<b>Class A</b>	Factory molded to conductor(s)
<b>Class B</b>	Field attached to conductor(s)

**1.2.3 Style.** Plugs and receptacles with following styles of housing are covered by this specification:

Style 1	<b>Plug, figure 1(a)</b>
Style 2	<b>Plug, figure 2(a)</b>
Style 3	Plug, figures 3(a), & 3(c)
Style 4	Plug, figures 4(a), <b>4(b)</b> & 4(c)
Style 5	<b>Plug, figures 7(a), 7(b), &amp; 7(c)</b>
Style 6	Plug, figure 8
Style 7	Receptacle, <b>figure 1(b)</b>
Style 8	Receptacle, figure 1(c)
Style 9	Receptacle, <b>figure 2(b)</b>
Style 10	Receptacle, figures 3(b), & 3(d)
Style 11	<b>Receptacle, figures 5(a), 5(b), &amp; 5(c)</b>
Style 12	Receptacle, figures 6(a), 6(b), & 6(c)

### 2. REFERENCED DOCUMENTS.

**2.1 General.** The following documents, of the issue in effect on the date of application for **qualification**, are applicable to the extent specified in this AC.

#### 2.2 Federal Aviation Administration (FAA) Standards.

AC 150/5345-53      Airport Lighting Equipment Certification Program

AC-150/5345-7      L-824 Underground Electrical Cable for Airport Lighting Circuits, Specification for

#### 2.3 American Society for Testing and Materials (ASTM) Standards.

B 33      **Tinned Soft** or Annealed Copper Wire for Electrical Purposes, Specification for

3.3.4 Seal. A watertight seal shall be provided between the mated plug and receptacle and between the rubber and metal parts of the plug and receptacle.

### 3.4 Fabrication and Materials.

3.4.1 General. Each plug and receptacle (cable connector), type, class, and style shall conform to the dimensions and construction requirements shown on the applicable figures in Appendix I of this specification.

3.4.2 Housing. The connector housing shall be molded from natural and/or synthetic elastomeric materials serving both as insulation and sheath to fully enclose the pins of the plug and sockets of the receptacle. The housing material shall be suitable for direct earth burial, submergence in water, and capable of withstanding limited attack from chemicals, typically present on the airfield, including but not limited to, oil, de-icing fluids and/or gasoline. Material compounds used in connector housings shall not contain more than 25 pounds (11 kg) of carbon black per 100 pounds (45 kg) of elastomer. Housings for Class A connectors shall be fabricated from materials capable of bonding to cable sheaths or conductor insulation, during the manufacturing process, to provide a watertight bond.

3.4.3 Pins and Sockets. The pins and sockets shall conform to all dimensions and construction requirements indicated on the applicable figures in Appendix I of this specification. Pins and sockets shall be made of materials that contain at least 98 percent copper, or free cutting brass alloy 360 (AMS C36000) and in either case shall be made of material at least "half hard". The contact portion of the pin and socket shall be left "stock hard" and the crimping section, when necessary, fully annealed. The hardness transition shall be limited to the locking section of the pin and socket. The pin and socket shall be electroplated with tin or other suitable material to provide good electrical contact as required by paragraph 3.3.1. The sockets shall be spring loaded or slotted and spring loaded to insure good electrical contact as required by paragraph 3.3.1 and. Class A sockets shall have a means that protects the sockets slots from filling with insulating compound during molding. The pin for the Style 3 connector shall be provided with a visual indication that verifies proper assembly position. Pins and sockets provided for Class B connectors shall have provisions for crimping to the cable conductor(s), and shall not exhibit damage after crimping.

### 3.4.4 Connector Assemblies.

3.4.4.1 Class A. Pins and sockets shall be held perpendicular to the face of the block. Suitable electrical conductors shall be mechanically and electrically connected to the pin(s) or socket(s). The connector housing shall be molded per paragraph 3.4.2. Primary connectors shall be molded to an electrical conductor having a voltage rating equal to or less than the specified voltage rating of the connector. Secondary connectors shall be molded to an electrical conductor having a voltage rating equal to or less than the specified voltage rating of the connector with the preferred being equal to the connector rating. A connector shall never be molded to an electrical conductor or cable having a higher voltage rating than the specification requirements for the connector. After molding, the space between the pins of Type II plugs shall not be less than 1/8 inch (3 mm) when the pins are pinched together with a force of 6 pounds (27 N) applied 1/2 inch (12.7 mm) out from the face of the plug. Also, the space between the ends of the pin of the Type II plugs shall not be greater than 9/16 inch (14.3 mm) when the pins are pulled apart with a force of 6 pounds (27N) applied 1/2 inch (12.7 mm) out from the face of the plug. The force is applied to the pins only. During testing for the above mentioned requirements the plug is to be held only to keep it from turning.

#### 3.4.4.2 Class B.

3.4.4.2.1 Type L Each receptacle shall be equipped with a disposable sleeve fitted into the receptacle's water seal to catch surplus silicone compound upon assembly. Each socket shall be equipped with a disposable pin fitted tightly into the pin end of the socket to prevent entry of silicone compound on assembly and to provide a visual indication of proper socket position after assembly. The pin design shall be such that proper internal dispersion of silicone compound in the assembly is assured. An adequate amount of silicone insulating compound shall be furnished with each connector to insure filling all internal voids when the connector is assembled. Each housing shall be capped with a disposable shipping cap on the cable entrance end.

**4.2.2.2 Connector Assembly.** After the conclusion of the test in paragraph 4.2.2.1, each plug and receptacle being tested shall be mated and immersed in a tap water bath at room temperature, 20-25 °C. Immerse not more than **2 feet (0.6 m)** of cable, 1 foot (0.3 m) of the plug, and 1 foot (0.3 m) of the receptacle. While immersed, each connector assembly shall be manually flexed for 2 minutes and then left **immersed** for a minimum of 24 hours **with its** cable leads flexed and maintained **180°** from its longitudinal axis. Measure insulation resistance between conductors of each connected assembly after the 24 hour soaking period. The resistance measurements shall be taken 1 minute after a test voltage of **4.7 kV** dc has been applied for 5 minutes to Type II connectors and **15 kV** dc to Type I **connectors**. The minimum resistance between conductors shall be 25,000 megohms. Heat the tap water to 65 °C without removing the assemblies and maintain this temperature for at least 1 hour. Again measure the resistance between the conductor(s) and water, and between conductors with a **500-volt** source. The minimum acceptable resistance after the heated soaking period shall be 10,000 megohms.

**4.2.3 Bond Test.** The molded bond between cable and Class A connector shall be subjected to a static longitudinal pull load of the magnitude specified in paragraph 3.3.2. When testing Class A, Type II, connectors of any Style the two conductors shall be pulled as a single cable, not as individual conductors. The connector shall be held in a manner that does not impart a crimping or clamping action to the connector that would affect the pull test. The connector molding cavity, or a similarly shaped fixture, is acceptable for holding the connector. Separation between the molded on connector and the cable jacket or conductor insulation exceeding **.03 inches** shall be cause for rejection.

**4.2.4 Mechanical Connection Test.** Each plug and receptacle intended to be mated shall be connected together and subjected to the static pull load specified in paragraph 3.3.3. Any evidence of separation of the **connection** shall be cause for rejection. Increasing load shall be applied to the connector assembly until separation occurs. No damage shall occur to the mating components when the **connected** plug and receptacle are separated by the greater static pull load. Any evidence of damage to plugs, receptacles, conductors, and/or the connector bond shall be cause for rejection.

**4.2.5 Electrical Connection Test.** Voltage drop measurements shall be made across mated connectors while conducting rated current. Voltage drops in excess of those specified in **3.3.1** shall be cause for rejection. This test may be performed using unmolded contacts conducting rated current. This would permit the measurement to be made without damaging the molded connectors. This test shall be performed on the equivalent of six **connectors** (six contact pairs for Type I connectors and twelve contact pairs for Type II connectors).

**4.2.6 Weathering Test.** A slab of connector housing material and sample pairs of connectors shall be subjected to simulated sunlight by conditioning with carbon-arc or xenon-arc radiation for 720 hours as described in Section 1200 of UL-1581. The conditioned and unconditioned slabs of **connector** housing material shall then be **evaluated** to Section 1200.9 of UL-1581, **Failure** of the test slab samples **and/or** the connectors to meet the ratio requirements of Section 1200.9 of UL-1581 shall be cause for rejection.

Additionally, a slab of **connector** housing material and sample pairs of connectors shall be exposed **to** ozone according to ASTM **D1149**, with 50 pphm ozone, **38° C**, 20 percent sample extension, and 100 hours exposure. Cracking of the connectors, or test slab, as a result of weathering test shall **be** cause for rejection.

**4.2.7 Metal Bond Test.** Class A assemblies shall have their **connector plug** and receptacle placed in water, with 20 **psi** air pressure applied from the free end of the cable, for a period of 10 minutes. No air bubbles shall be observed in the water.

## 5. PRODUCTION TEST REQUIREMENTS.

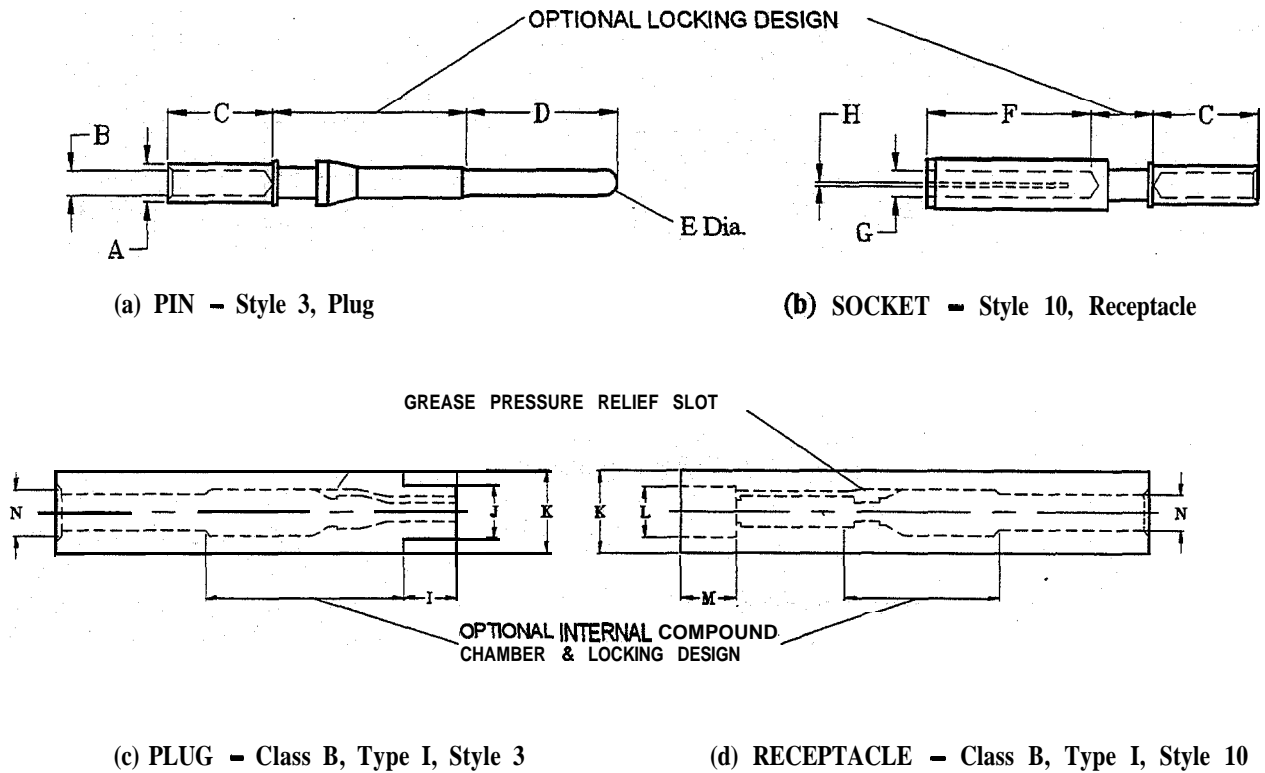
**5.1 Production Tests.** Each **connector** shall be **visually** inspected and interface dimensions checked in accordance with process control below. Each plug and receptacle, cable connector (Class A) shall **be** subjected to a dielectric and continuity test during validation of a production run. The test voltage shall be **4.7 kV** dc for Type II **connectors** and **15 kV** dc for **Type I** connectors. The minimum insulation resistance between the conductors shall be 23,500 megohms for Type II connectors and 750 megohms for Type I **connectors** (0.2 microamps leakage current). The time of application of

# APPENDIX I

## Cable Connector Figures

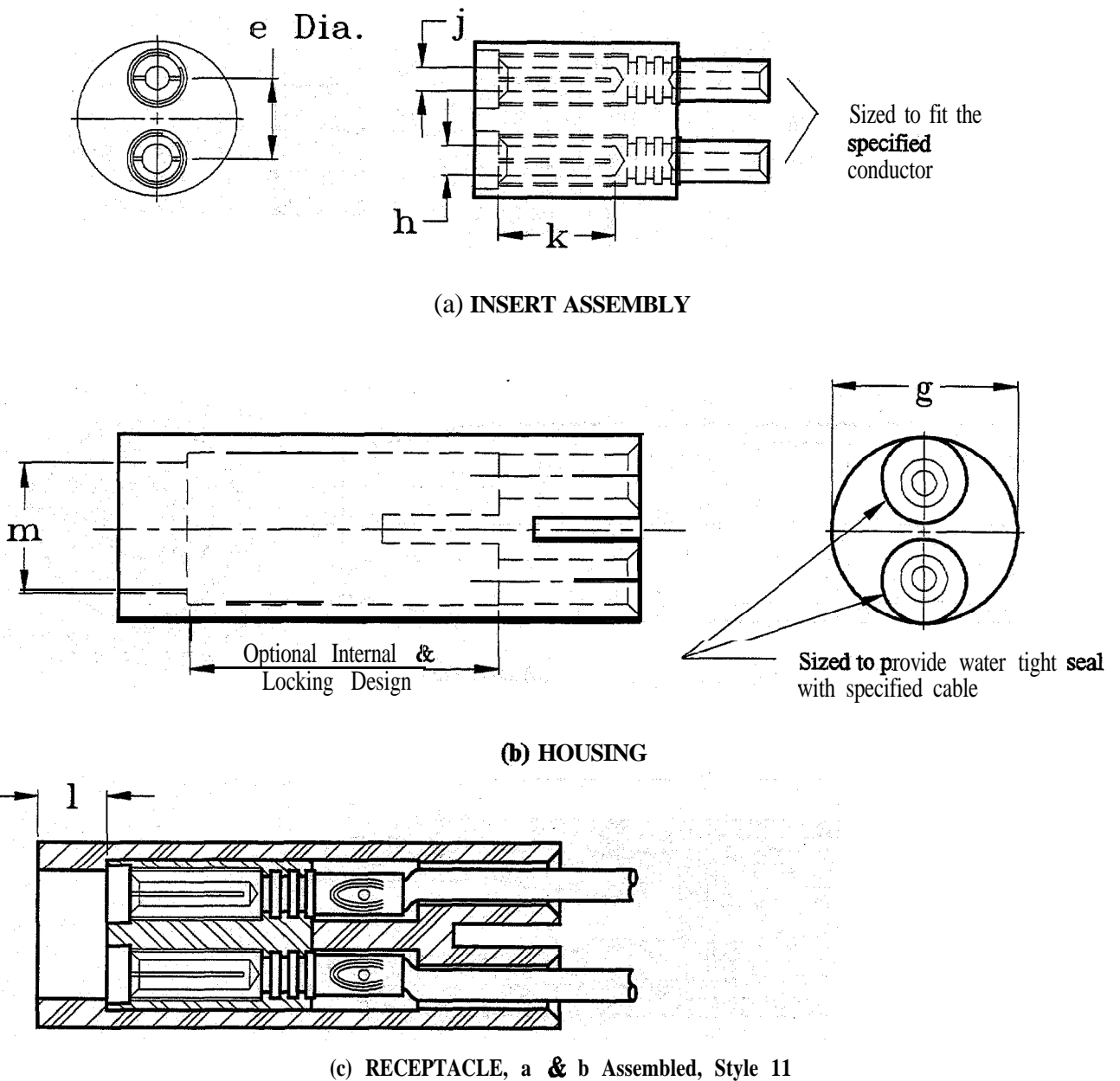
DIMENSION	INCHES	MILLIMETERS	REFERENCES
a	0.155 ± .001	3.937 ± 0.025	Connector
b	0.124 ± .001	3.150 ± 0.025	Connector
c	0.625 ± .015	15.875 ± 0.381	Plug pin
d	0.343 + .03 1, -.000	8.712 + 0.787, -.000	Plug
e	0.435 ± .010	11.049 ± 0.254	Plug, Receptacle
f	0.725 + .020, -.000	18.415 + 0.508, -.000	Plug
g	1.000 + .000, -.03 1	25.40 + .000, -.787	Plug, Receptacle
h	0.1570 + .0010, -.0007	3.988 + 0.0254 -.018	Socket Diameter Before Splitting
j	0.1260 + .0010, -.0007	3.2004 + 0.0254 -.018	Receptacle.
k	0.641 Min.	16.28 Min	Depth Of Socket <b>Includes .125"</b> (.318 cm) Recess Below Inside Face Of Receptacle
l	0.358 + .000, -.015	9.093 + .000, -.381	<b>Receptacle</b>
m	0.694 ± .010	<b>17.628 ± .254</b>	Receptacle
n	1.125 ± .031	28.575 ± .787	Receptacle
o	1.500 ± .031	38.10 ± .787	Receptacle
P	1.750 ± .031	44.45 ± .787	Receptacle

**FIGURE 1A.** Class A and B, Plugs and **Receptacles** - Dimensions



DIMENSION	INCHES	MILLIMETERS	REFERENCE
A, B, C	Dimensioned to provide a compression fitting for the specified cable size		
D	1.062 ± .015	26.975 ± .381	Pin
E	0.186 ± .001	4.7244 ± .0254	Pin
F	1.080 Min.	27.432 Min.	Depth of socket includes .125" (3.175 mm) recess below inside face of the receptacle
G	0.188 + .001, - .0007	4.7752 + .0254 - 0.0178	Socket (Before splitting)
H	0.025 ± .010	0.635 ± .254	Socket (minimum of 2 saw slots) if req.
I	0.593 + .015, - .000	15.062 + .381, - .000	Plug
J	0.604 + .010, - .000	15.342 + .254, - .000	Plug
K	0.937 + .000, - .031	23.800 + .000, - .787	Plug, Receptacle (Note : K dimension may vary except within 1" (25.4 mm) of the mating ends measured from the connector tip)
L	0.573 ± .010	14.554 ± .254	Receptacle
M	0.608 + .000, - .015	15.443 + .000, - .381	Receptacle
N	Dimensioned to provide a waterproof seal with the cable insulation		

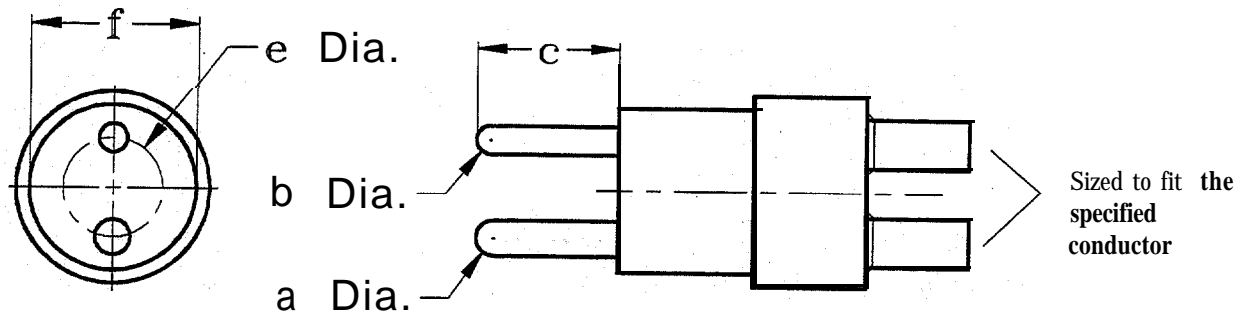
**FIGURE 3.** Class B, Type I, Style 3, Plugs and Class B, Style 10, Receptacle - Single Conductor, 5000 Volts, 25 Ampere

**Note:**

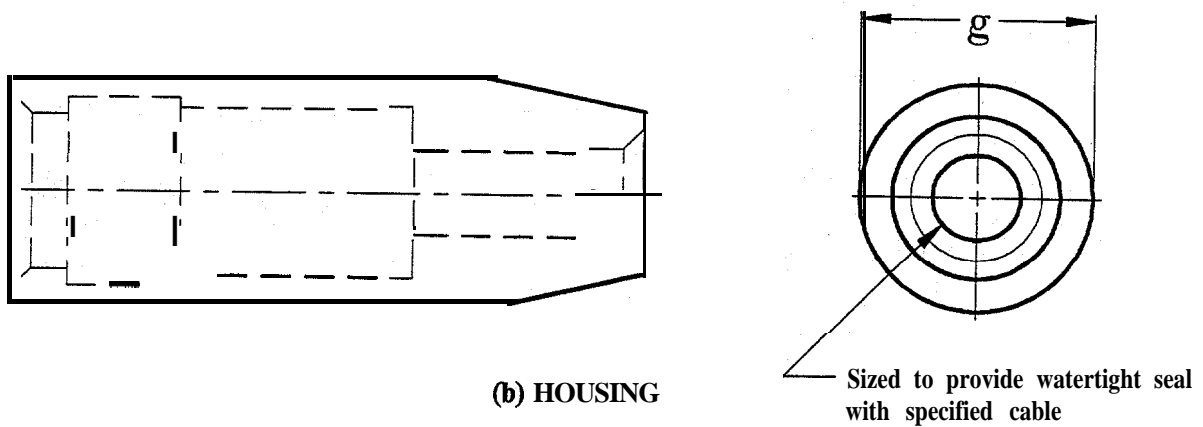
Dimensions are defined on Figure 1A.

**FIGURE 5.** Class B, Type II, Style 11, Receptacle • Two Conductor, 20 Ampere, 600 Volts Between Contacts, 1500 Volts to Ground

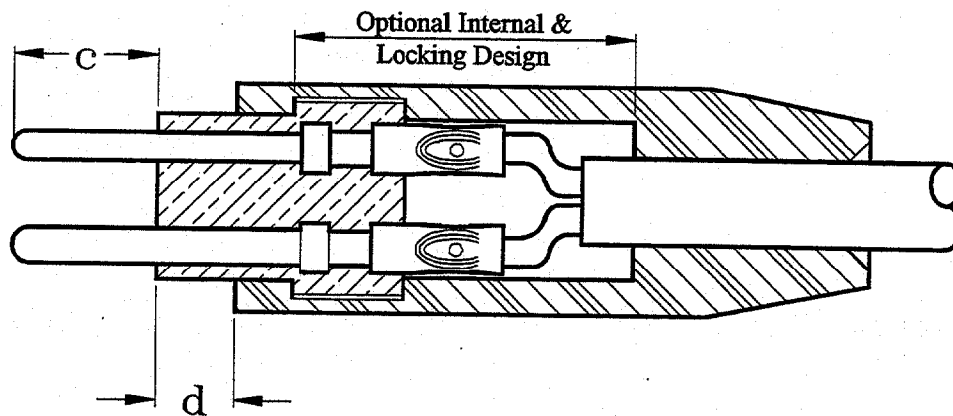




(a) INSERT ASSEMBLY



(b) HOUSING



(c) PLUG, a&amp;b Assembled, Style 5

**Note:**

Dimensions are defined on Figure 1A.

**FIGURE 7.** Class B, Type II, Style 5, Plug - Single Conductor, 20 Ampere, 600 Volts Between Contacts, 1500 Volts to Ground